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ABSTRACT

The second in a series concerning some implications of learners' cognitive style for the development of reading competence, this paper explores the relationships between cognitive style and reading achievement, with attention to such factors as the stability and flexibility of cognitive style functions. The paper discusses J. E. Hill's concept of cognitive mapping as it relates to understanding the development of reading ability and to the concepts of field dependence/field independence and reflectivity/impulsivity as they relate to reading ability. The paper concludes that reading researchers should continue to explore the implications of cognitive style mapping for instructional improvement. (MKM)

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Cognitive Style Mapping and The Facilitation of Reading Competence - A Position Paper.

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1. INTRODUCTION

In a paper presented at the Sixth World Congress of the International Reading Association in Singapore last year, (Scott and Annesley, 1976) the authors pointed to a new and potentially fruitful avenue for the pursuit of reading competence, viz. the matching of instructional materials and strategies to the cognitive styles of learners. After Robinson (1966), reading competence was defined as the ability to respond meaningfully to written words - to understand their literal, related and applied meanings relevant to the context of their occurrence and to react thoughtfully and emotionally to what is understood. Cognitive style was defined as an individual's relatively stable preferences in modes of perceptual organization and conceptual integration of the external environment (Kagan and Kogan, 1970).

Nine dimensions of cognitive style were defined as identified and described by Messick (1970), viz. *field dependence, scope of scanning, breadth of categorizing, conceptualizing style, cognitive complexity, reflectiveness, information processing, flexibility of control* and *tolerance for incongruous or unrealistic experiences* (See Appendix A). Although consistent and significant research evidence of a relationship with reading achievement appears to date only in the case of the field dependence, conceptualizing style, reflectiveness and scanning dimensions, it was recognized that individuals function as integrated beings. Accordingly it was agreed that from individual cognitive profiles we

should be able to generate a set of cognitive typologies which might then be used to offer guidance to education for matching reading materials and instructional strategies to individual learners.

The present paper seeks to develop further the avenues indicated in our Singapore paper relating them to the concept of cognitive mapping as generated by Hill (1971), to which we shall return shortly. The stimuli for this paper are twofold. The first of these is a growing public concern at the magnitude of the "reading problem" in our affluent and otherwise literate society. For example, the recent Leeves and Bourke (1976) report on literacy and numeracy in Australian schools indicates that three percent of otherwise normal 10 year-olds were unable to read simple sentences and 25% to 30% were unable to respond correctly to the comprehension questions asked. Similar percentages for reading comprehension performance have been reported by Thorndike (1973) for England, Scotland, the United States and New Zealand.

The second stimulus is the awareness that intended solutions to the "reading problem", i.e. curriculum materials and associated recommended teaching strategies abound. Each reflects one emphasis or another relating to the designer's views on the nature of learning to read - but with varying degrees of success. All reading programs appear to be successful in teaching some learners how to read. But equally, they have proven ineffective with some learners of normal ability with no apparent identifiable causal condition to account for their failure to learn to read.

Perhaps we have sown the seeds of our own failure by a disproportionate emphasis on the nature of learning to read rather than on the nature of the learner, and by such norm referenced questions as, Why doesn't John learn to read when he has the same ability, the same curriculum and the same teacher! John may well need a different curriculum and a different teaching methodology because of his own way of apprehending, transforming and utilizing information - that is, because of his own cognitive style.

One clear implication of all of this is that reading teachers must be familiar with all approaches and materials in order to diagnose a particular learner's needs and then select the desirable strategies to meet those needs - a formidable task. Perhaps an initial step which could provide some structure within the vast array of materials and methods currently available would be to establish a theoretical framework within which solutions might be formulated.

What appears to the writers to be a profound attempt to generate such an educational framework for diagnosis and individualized prescription is Hill's (1971) notion of cognitive mapping generated within his model of "The Educational Sciences." The central thesis underlying the model he proposes is that, "if education is to be regarded as a relatively vigorous applied field of information similar to those of medicine, engineering, law and pharmacy, its conceptual framework must reflect a scientific orientation ... Now while medicine and engineering for example each have a reasonably well defined conceptual framework and language, education is composed of a loosely knit collection of methods

and materials whose patterns and structures contribute little to the development of precise bodies of information." (pp.4, 5).

If we accept that education is a social system involving persons, processes and properties, and their interconnections, then Hill proposes that seven systems can be studied together to comprise the educational sciences.

It will be of value to note the seven systems of study that comprise Hill's educational sciences model, although we will only make reference later in the paper to those which specifically have inputs to cognitive style mapping and the reading process. The educational sciences, then, can be broadly conceptualized as (1) Symbols and their meaning, (2) Cultural determinants of the meaning of symbols, (3) modalities of inference, (4) neurological, electrochemical, and biochemical aspects of memory functions, (5) cognitive styles of individuals, (6) teaching, administrative, and counselling styles, and (7) systematic analysis and decision making.

Our specific task in this paper is to indicate some of the facets of cognitive style that the research literature has shown to be related to reading achievement and to suggest that cognitive style mapping may be a fruitful area, within the theoretical framework of the educational sciences, for future reading research and for classroom application.

2. COGNITIVE STYLE

Of the nine dimensions of cognitive style referenced in the introduction, the most thoroughly researched dimension[1] to date is that identified by Witkin *et al.* (1954), viz, field dependency-independency or the analytic vs. global dimension as it was originally called. Field Independence has been defined as the ability to overcome embedding contexts in perceptual functioning, and it is conceived as being the "analytical" aspect of an articulated mode of field approach as expressed in perception (Goodenough, 1976, p.675).

It seems important to ask whether cognitive style is an ability. Abilities concern level of skill - the more and less of performance - whereas cognitive styles give greater weight to the manner and form of cognition. Abilities tend to be unipolar in that they extend from a minimum to a maximum and often carry a fairly heavy value laden overlay, whereas cognitive styles are contrasts, and while they may be bi-polar it is possible to define circumstances where it is an advantage to be at one end or the other. If there is any value differentiation it is a function of situation and task. In this regard, Messick (1970) comments:

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1. Three separate Research Bulletins published by Educational Testing Service, Princeton N.J. dated 1972, 1974, 1976, provide references for some 2,500 studies that have been conducted in the area of Field Dependence-Independence and Psychological Differentiation. Of these studies only approximately 5% have been directly related to reading ability.

> The fact that certain types of problem situations and certain types of subject matter favor field-dependent subjects over field-independent subjects and vice-versa (just as other types of problems might favour broad categorizers over narrow categorizers or levellers over sharpeners, and vice-versa) is extremely important, since it highlights the relativity of value of the opposing extremes of each cognitive style. Unlike conventional ability dimensions, one end of these stylistic dimensions is not uniformly more adaptive than the other (p.193).

Two other aspects of cognitive style, namely, stability and pervasiveness appear in the research literature, although not under those headings. Stability does not mean that cognitive style is unchangeable, indeed it is part of the thesis of this paper that style augmentation may be a valuable adjunct to the learner in his interaction with the environment. But with respect to the ordinary daily tasks there is a high consistency across time of cognitive style functionings. Bauman (1951), Witkin *et al.* (1962, 1967) and Faterson & Witkin (1970) have shown that while mode of cognitive functioning becomes progressively more articulated, and perception more field independent with age, up to late adolescence, at the same time, however, a child's relative level of articulation vis-a-vis his peers is quite stable. From ages 10 to 14, the test-retest reliability of field independence scores was .64 for a group of thirty boys and .88 for a group of thirty girls, and from age 14 to 17 it was .87 for the boys and .94 for the girls.

With respect to the pervasiveness[2] of cognitive style

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2. For a detailed review of the literature that establishes the research base for this point of view the reader is directed to Witkin, H.A., Moore, C.A., Goodenough, D.R., and Cox, P.W. Field-dependent and field-independent cognitive styles and their educational implications. Review of Educational Research, Winter 1977, 47, (1). pp.1-64.

functioning it is now quite clear that we are dealing with a broad dimension of individual differences that extends across such areas as perception, intellectual activities, social behavior, personality, vocational interests, psychotherapy, and body concept. However, it is important to note as Erickson (1974) stresses that cognitive style dimensions are fluid and adjustable rather than fixed. Individuals use a number of different processes to handle different information in different situations.

3. COGNITIVE STYLE AND READING COMPETENCE

An increasing body of literature is building up indicating the relationships that exist between the various dimensions of cognitive style and reading achievement. Gluck (1973) has shown field independence to be significantly related to reading achievement in the first grade, while Frehner's (1973) results indicate that field independence is significantly related to reading at the sixth grade level. Smith (1973) found that field independence was related to reading for detail or selectively attending to and recalling details in a short paragraph. Further support for a positive relationship between field dependence-independence and reading achievement comes from the work of Watson (1971), Wineman (1971), Erickson (1974) and Cox (1976).

The reflectiveness, or impulsivity vs. reflectivity, dimension has also been studied for its relationship with reading achievement. Reflective children are more fearful of

making errors and therefore response time is increased as they consider more carefully the scope of the problem. They may be characterised as "response uncertain". On the other hand impulsive children show little anxiety over giving a quick answer regardless of its accuracy. They may be characterised as "response certain". Research has shown that when stimulus conditions involving high response uncertainty are present, reflective children perform qualitatively better than impulsive children on a widevariety of tasks including visual discrimination (Kagan *et al.*, 1964; Adams, 1972), word recognition (Kagan, 1965b, Roettger, 1971), prose reading tasks (Kagan, 1965 b, c), serial recall and problem solving (Adams, 1972, Ault, 1973) and comprehension skills of focusing on details and ability to find main ideas (Erickson, 1974). Further support for the relationship between impulsivity and reflectiveness and reading ability comes from the work of Santostephano *et al.* (1965).

Two other dimensions of cognitive styles have been shown to be related to reading achievement. Annesley (1971) showed that when fifth grade boys were stratified into below average, average, and above average in reading ability based on three independent measures, that the above average reader used an analytical style of classification almost twice as much as the below average reader. This finding has been supported more recently by Robinson & Gray (1974) who report the analytic style of conceptualizing as the most important contributor in the prediction of school learning (vocabulary, reading comprehension etc.). Denney (1974) has demonstrated that attention style (scanning) differentiates between good and poor readers.

Much of the research cited thus far has made it clear that with respect to reading research we must begin to look beyond the question "what has she learned?" to the more fundamental question "how does she learn?" a question that concerns itself with process rather than product. Sawyer (1974) in a provocative article concludes, "we must reject 'simple' answers to chronic learning problems; we must stop wasting our time looking for the right material to teach the most appropriate skills in the mostuseful sequence. We must begin to focus attention on structuring learning environments where we might promote the attainment of concepts, motivation, flexible cognitive strategies and styles so as to enable more efficient learning..." (p.561). A similar view has been expressed by the Bullock Committee (Bullock, 1975, p. 78). This, of course, is not to deny the need for appropriateness of materials but rather that a much broader set of factors must be taken into consideration. In our Singapore paper (Scott and Annesley, 1976) we tabulated some hypothesized implications of consideration of such factors for aspects of the reading curriculum (See Appendix B).

Sunshine and DiVesta (1976) lend credence to the intent of Sawyer's plea. This study combined measures of field dependency-independency and reflectivity-impulsivity on first grade children who were set discrimination tasks presented in vertical and horizontal formats and in high and low density arrangements. In their discussion they comment, "It is apparent from our findings that while both impulsives and field-dependents make more errors than do their counterparts

(reflectives and field independents), they do so for different reasons. Impulsives (are) response certain ... tend to accept the evaluation of their initial responses as correct and, therefore, fail to consider other alternatives ... Field dependents make discrimination errors because of contextual factors surrounding the letter to be discriminated - that is (they are) stimulus uncertain" (p.19). It seems apparent then that in understanding the problems of reading we should look not only at "what" has to be learned but at "who" and "how" this particular learner can best utilize the learning environment structured for him. One implication arising out of the foregoing study is that the specific learner difficulties - once identified - can be partially offset by the initial use of other than traditional formats, such as those with low density or with vertical arrangements; a conclusion similar to that reached by Nodine and Hardt (1970) with pre-school subjects.

4. EDUCATIONAL IMPLICATIONS OF COGNITIVE STYLE

An initial review of the literature on cognitive style has shown it to be an important variable in the perceptual, intellectual, personality and social domains. It is evident that many more specific questions are yet to be answered with respect to the inter-action between the cognitive style of a learner, his reading ability and other variables. For example, what are the effects of differing reinforcement strategies on

reading achievement for field dependent vs field independent children. Evidence from experimental studies on serial learning suggests that field-independent persons tend to learn more than field-dependent persons under conditions of intrinsic reward (Fitz, 1971; Paclisanu, 1970; Steinfeld, 1973). However, this difference disappears when external rewards for learning are introduced, regardless of whether the rewards are material in nature or in the form of praise (Ferrell, 1971; Steinfeld, 1973).

Most of the research on the effects of punishment have made use of verbal criticism. These studies provide evidence that field dependent people are more affected by criticism than field-independent people (Duvall,1970; Ferrell, 1971; Randolph, 1971). Applied research in this area in the classroom is in its infancy (Raab, 1974) yet the evidence suggests that field-dependence-independence may provide a useful basis for understanding and predicting which students are likely to be affected by various kinds of reinforcement.

Information processing theory suggests that feedback is an important function in the teacher-learner model. Most teachers accept this as a matter of common sense. The evidence with respect to field-dependent-independent students makes clearer the actual dynamics that are operating. What seems to be the important factor is not the feedback *per se*, but the degree of structure or organization in the course, or unit of instruction (Fleming *et al.*, 1968; Koran *et al.*, 1971; Greene, 1972; Nebelkopf *et al.*,1973).

It is not difficult to see that in teaching reading, field dependent students may need more explicit instruction in problem solving strategies or more exact definition of performance outcomes than field-independent students who may even perform better when allowed to develop their own strategies. Certainly as we learn more of how children learn to read, it would seem practical to suggest that teachers might adapt instructional procedures to meet the patterns of cognitive style functioning.

This raises the question, what differential patterns of teaching behaviour are likely to occur in classrooms as a function of teacher cognitive styles? Of the few studies done in this area most have been conducted in simulated teaching situations. But the data at least are in keeping with what we know of field dependent-independent behaviour. For instance, field dependent teachers favour teaching situations that are personal in nature, and allow for interaction with students; they believe that class discussion produces better learning; use questions primarily to ascertain how their instruction is going; use less critical comments about student performance; are seen by students as teaching more facts than principles, and develop a warm rapport with students. (Wu, 1968; Moore, 1973; Bogo *et al.*, 1970; Ihelevich and Gleser, 1971; Witkin *et al.*, 1968; Engelhardt, 1973).

Given that students' cognitive styles may be augmented, it seems logical to suggest that by making teachers aware of their own cognitive styles they too may increase their adaptability with respect to the teaching strategies used.

It would not be appropriate to conclude this section of the paper which has looked at both students and teachers cognitive styles without at least briefly considering the important question of the interaction between the two in real classrooms. While Witkin (1977) comments that there have been only three studies of teacher-student match-mismatch[3], two of these are quite illuminating and arouse real interest in what further studies will reveal concerning the teaching-learning process.

DiStefano's (1970) research was in a natural classroom. He found that teachers and students matched in cognitive styles viewed each other positively, while those mismatched viewed each other negatively. It seems important to note that this positive and negative evaluation was concerned not only with personal, but cognitive characteristics also. James (1973) created a special minicourse in which each teacher taught a class of three field dependent and three field-independent students. Results from a questionnaire similar to that used by DiStefano confirmed his findings. Students found greater interpersonal satisfaction from matched rather than mismatched teacher-student environments. Prior to the final exam, James asked each teacher to assign grades to each student on the basis of their classroom performance. The most extremely field-dependent teacher assigned the three highest grades to his three field-dependent students, while the most extremely

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3. For an extended discussion of the issues involved in the match-mismatch issue, the reader should refer to p.36 following of Witkin *et al.* Field-Dependent and Field-Independent Cognitive Styles and their Educational Implications. Review of Educational Research, 1977, 47, (1).

field independent teacher awarded all three of his field-independent students higher grades than the three field dependent students.

5. COGNITIVE STYLE MAPPING

The research evidence is now overwhelming that cognitive style is a key variable in any instructional process. It provides the impetus to raise such issues as, individualized instruction, materials that maximize the student's learning, and patterns of cognitive style. Inthis regard, Messick (1970) suggests that "these stylistic dimensions (cognitive style) offer for our appraisal new types of process variables that extend the assessment of mental performance beyond the crystalized notion of achievement levels to a concern with patterns of cognitive functioning." (p.196).

Perhaps the most systematic attempt to apply the concept of cognitive style to a system of personalized educational programs, has been that of Hill (1971). The educational science of cognitive style being the fifth of the seven educational sciences Hill proposes in his model, remains potentially at least, the most significant for those engaged in the act of teaching.

The concept of cognitive style employed as an educational science is somewhat different from the concept as discussed earlier in this paper. Though in operational terms both usages are directed towards explaining how individuals take note of their surroundings, become informed and seek meaning, differ-

ent components are incorporated in Hill's concept. In Hill's model cognitive style is defined in terms of cognitive mapping, which provides a picture of the diverse ways in which an individual acquires meaning. Basically there are four components of the map which relate respectively to how the individual (i) receives information, (ii) interprets information, (iii) draws conclusions from information and (iv) recalls information. These components are labelled by Hill *Symbolic Orientations, Cultural Determinants, Modalities of Inference,* and *Educational Memory* respectively. However Hill indicates that since insufficient work has been done on Educational Memory, his mapping procedure is confined to the first three components. Each component incorporates a number of behavioural or source elements derived from surveys of the research literature (commonality of focus within each set of elements has not yet been empirically demonstrated.

Following the very simplified[4] statement of the model offered by Kalfas *et al* (1975) under symbolic orientations the "map indicates whether an (individual) obtains meaning by reading or listening and whether he best expresses himself by speaking or writing. It also shows how much he depends on his sense of smell or touch in deriving meaning, how well he empathizes with others, how well he obeys the rules and even his ability to use gestures in speaking. These items give clues to the student's feelings, commitments, and values".(p.6) In the second component, cultural determinants, the map "reflects the effect of social groups, whether it be associates or family, and how the (individual) perceives life." (p.7).

4. The complexity and thoroughness of the basic Hill model is illustrated in Appendix C.

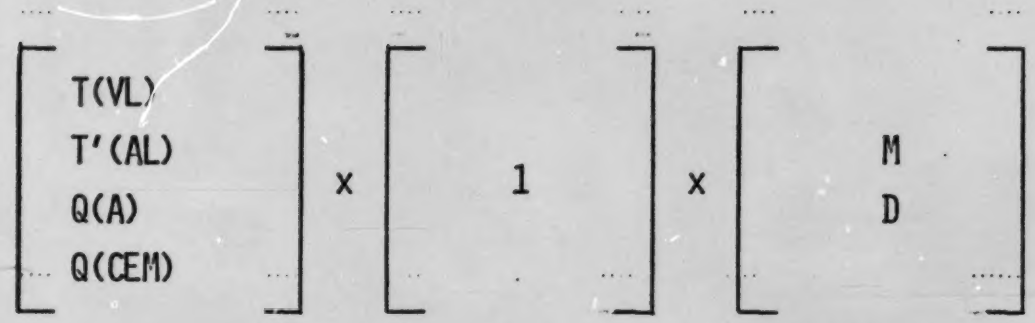
It also reflects the learner's individuality. The third component, modalities of inference, "illustrates the ways in which the (individual) reaches decisions or how he reasons," (p.8) through such processes as classification, differentiation, multiple relationships, and adherence to rules.

The cognitive map is derived from the administration of a battery of tests and inventories which indicate appropriate scores for each individual on each unique element. Scores on each element are expressed in terms of whether for a particular individual the element is a major orientation (i.e. the individual's score falls between the 50th-99th percentile for his developmental level), a minor orientation (i.e. between 26th-49th percentile), or a negligible orientation (at or below the 25th percentile). Negligible orientations are omitted from the final cognitive map. The map may then be supplemented through empirical mapping, by additional assessments derived from observation and/or interview. Thus, the resulting map identifies cognitive strengths and weaknesses - the information then being used to build a personalized program of instruction. Again, after Kalfas *et al* (1975, p.5), an individual's cognitive map may be translated from the Hill-type computer print-out and appear in verbal form as in Figure (1). (p.17)

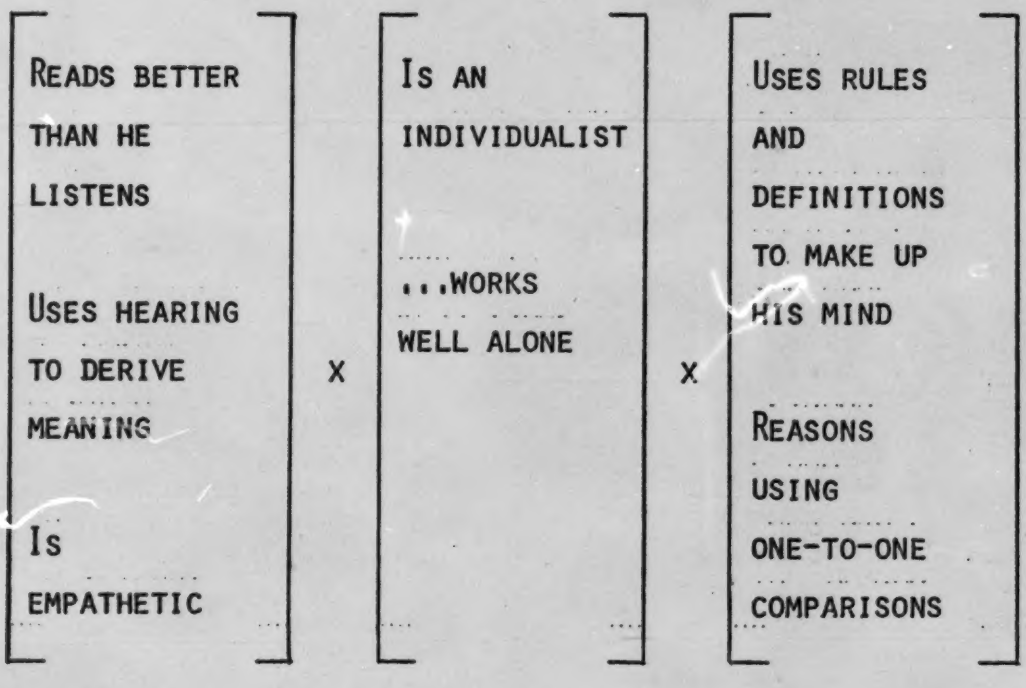
As Kalfas (1975, P.9) says "With the completed map as a starting point, the teacher begins the process of providing a prescription. This amounts to building the (learner's) major orientations as determined by the map to facilitate learning. In addition, the teacher will program experiences to improve the student's minor orientations so that all facets of his personality will be developed."

FIGURE 1.

A SAMPLE COGNITIVE MAP



THIS IS HOW IT WOULD LOOK IN WRITING:



Hill's "cognitive mapping" model gains its relevance for reading instruction through its focus on critical factors in arriving at meaning, viz. perception of stimuli, cultural factors influencing interpretation, and reasoning processes. However, we argue that, on the surface at least, the model does not appear to accommodate the known significant dimensions of cognitive style discussed in the early part of this paper. Perhaps we are wrong! Accordingly, part of our immediate research plans are aimed (i) at attempting to conceptually validate, and if necessary make modifications to, Hill's model and (ii) at developing appropriate sets of alternative instructional materials and programs. Such directions and proposed uses of the model appear below.

6. FUTURE DIRECTIONS OF RESEARCH

Our new research directions are best summarized in the following parts:

1. Working with adolescents, it is intended to administer both the traditional Hill tests and inventories together with a battery of tests to measure performance on the cognitive dimensions described by Messick (1970). To accommodate anticipated reading problems, verbal tests will be administered in appropriate forms from among language master format, audio cassette format, card file sorting format, and oral presentation. The resultant scores will be factor analyzed to ascertain the underlying basic dimensions or components. Because

we are attracted by Hill's methodology rather than his labels, we accept at the outset the possibility that the emerging pattern may not equate that of his model.

2. The emerging dimensions from the analysis in (1) will then be used as a basis for a new type of cognitive map constructed in accordance with Hill's notion of major, minor and negligible orientations.

3. A materials and procedures developmental phase (based on an extension of Appendix B) will be implemented to design and test materials and processes likely to facilitate those of given cognitive profiles in the development of reading competence.

4. Since much teaching of reading is in and is likely to remain in large group situations an attempt will be made to cluster analyze the cognitive maps obtained in (1) to arrive at cognitive map typologies which it is hoped may then be related to particular instructional programs.

5. Again, much teaching energy will be directed towards individual remediation. In appropriate cases, the individual maps derived in (1) will be used as the stepping off point for personalized reading.

7. CONCLUSIONS

In our Singapore paper we concluded after Kogan (1971) that "though the practical pay-offs of cognitive style research are still quite meager for the teacher, the promise of future rewards is strongly indicated if energy and imagination are

applied to the task" (p.292). Renewed literature searches have demonstrated a growing body of studies exploring relationships between cognitive style dimensions and facets of reading competence. However, there remains a dearth of studies devoted to the application of knowledge gained from these studies to the improvement of reading instruction. The former studies have been and remain an essential part of the developmental process. It is our contention that as a next step presently available research findings should be synthesized into a theoretical framework or model to give guidance to the generation of effective instructional programs. This paper is intended as a contribution in that direction.

APPENDIX A.

Some Dimensions of Cognitive Style

1. *Field dependence* which was identified by Witkin *et al* (1954) and relates to the degree of an individual's dependence of perception of phenomena upon the context in which they occur, that is, is the individual more analytic (field independent) or global (field dependent) in his/her perceptions.

2. *Scope of scanning* - which was first conceptualized by Schlesinger (1954) and refers to the extensiveness and intensity of an individual's attention to phenomena, that is, is the individual broad or narrow in his attention.

3. *Breadth of categorizing* - which was highlighted by Bruner *et al* (1956) and is the extent to which the individual shows a consistent preference for broad or narrow categories in handling phenomena.

4. *Conceptualizing style* - which stems from the work of Gardner (1953) and Gardner and Schoen (1962) and refers to the degree and bases of conceptual differentiation typically used by the individual in dealing with phenomena.

5. *Cognitive complexity* - which can be traced to the work of Kelly (1955) refers to the extent to which the individual construes phenomena in multidimensional and discriminating ways.

6. *Reflectiveness* - which was identified and defined by Kagan *et al* (1964) and refers to the usual relative speed with which an individual selects hypotheses and processes information, that is, is the individual consistently reflective or consistently impulsive in dealing with phenomena.

7. *Information processing* - which was highlighted by Gardner *et al* (1959) using the label leveling vs. sharpening and refers to the preferred style of the individual for incorporating new phenomena into his/her memory matrix, that is, does the individual show a preference for assimilation (leveling) or accommodation (sharpening) in the Piagetian (1926) sense?

8. *Flexibility of control* - which can be traced to the work of Klein (1954) and relates to an individual's susceptibility to distraction and cognitive interference in reacting to phenomena.

9. *Tolerance for incongruous or unrealistic experience* - which was initially brought into focus by Klein and Schlesinger (1951) and refers to the extent to which an individual displays a willingness to accept perceptions at variance with conventional experience.

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APPENDIX B

Some Hypothesized Implications of Cognitive Style for Aspects of the Reading Curriculum

Cognitive Style Dimension	Orientation Categories	Implications for Scope	Implications for Content	Implications for Format	Implications for Teaching Strategies
1. Field Dependency	a. analytic vs. b. global	Cognitive styles develop from early childhood, thus a reading curriculum should be influenced by them from prereading through the development of reading competency.	Approach toward attack favours decoding of regularly patterned words and word families Responds best to words and ideas linked with contextual cues and socially oriented content.	Ancillary materials should provide for decoding and encoding (word building) exercises Ancillary materials should provide for word and sentence matching and completion exercises.	Performs best on individually tailored reading program - adaptable to either individual or group situations Performs best on group learning tasks - more responsive to discovery learning.
2. Scope of Scanning	a. broad span of attention vs. b. narrow span of attention			Capable of coping with longer and more complex sentences. Performs best with relatively short and simple sentences.	Individual reading program should specify degree of habituation or modification required. Modification objectives most likely met in teacher-involved group learning contexts. Questioning strategies should be specifically related to the dimension.

APPENDIX B

Cognitive Style Dimension	Orientation Categories	Implications for Scope	Implications for Content	Implications for Format	Implications for Teaching Strategies
3. Breadth of Categorizing	a. preference for broad categories vs. b. preference for narrow categories	Cognitive styles develop from early childhood, thus a reading curriculum should be influenced by them from prereading through the development of reading competency.		Ancillary reading materials should include exercises and activities which provide opportunities for both orientations	Techniques should be adopted which will promote and habituate both categories
4. Conceptualizing Style	a. descriptive (analytic) vs. relational (non-analytic)		Content should make possible response to conceptual questions on such bases as: subject; topic; theme; ideas; facts; outcomes; sequence in time; relationships of cause and effect, time and place of occurence etc.	Ancillary materials should provide opportunities for word grouping and sentence classification exercises reflecting analytical and relational systems. Reading skill materials should incorporate conceptualizing exercises as part of communication skills	Individualized learning appropriate to reinforcement of style. Teacher-involved group work appropriate to objective of modifying style.

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APPENDIX B

Cognitive Style Dimension	Orientation Categories	Implications for Scope	Implications for Content	Implications for Format	Implications for Teaching Strategies
5. Cognitive complexity	a. complex (multidimensional) vs. b. simple (unidimensional)	Cognitive styles develop from early childhood, thus a reading curriculum should be influenced by them from preceding through the development of reading competency.	Reading content should vary in richness of literary quality to permit learners to cope at their own rate.	Exercise types in ancillary materials should permit both orientations to be met.	Teaching activities should recognize both styles, concentrating first on simple statements of plot etc. - elaborated through directed questioning in relation to content.
6. Reflectiveness	a. reflective vs. b. impulsive		Attention should be given to "interest" in both content and question form. The latter should vary in complexity and in demands on higher intellectual processes to accommodate both styles	Would cope well with ancillary work cards and activity sheets. Exercises can be longer and requiring more analytical, synthetical Self correction feedback systems needed. Units should be attractive and interesting to sustain attention.	Performs well on individualized tasks - task oriented - prefers to avoid group work Requires close teacher or peer supervision of tasks. Requires training in use of situational cues.

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APPENDIX B

Cognitive Style Dimension	Orientation Categories	Implications for Scope	Implications for Content	Implications for Format	Implications for Teaching Strategies
7. Information Processing	a. leveler vs. b. sharpener	Cognitive styles develop from early childhood, thus a reading curriculum should be influenced by them from prereading through the development of reading competency.	Copes with new and challenging settings, ideas and themes	Ancillary materials at all levels should provide opportunities for assimilation and accommodation of ideas, information and lexical meanings	Likely to respond to use of advance organizers. Requires involvement in teacher and small group discussion to broaden style Should be encouraged to utilize wide range of extended reading materials and to engage in creative writing
8. Flexibility of Control	a. distractable vs. b. non-distractable		Distracted by complex and involved ideas and themes	Likely to be distracted by appearance of page crowding and by more than simple illustrations.	Choice of materials will be related to less complicated materials, in appearance. Likely to require more teacher supervision but likely to perform better in individualized learning.
			Can cope with appropriate levels of complexity in ideas and themes.	Not easily distracted by text format or by illustrations	Likely to choose materials more for their interest. Likely to cope with either individual or group learning

APPENDIX B

Cognitive Style Dimension	Orientation Categories	Implications			
		for Scope	for Content	for Format	for Teaching Strategoes
9. Tolerance of Incongruities	a. tolerant vs. b. intolerant	Cognitive styles develop from early childhood, thus a reading curriculum should be influenced by them from pre-reading through the development of reading competency.	Likely to respond well to fantasy and humour Likely to show a preference for materials based on realism. Themes should be reality based	Responds well to the incongruent Incongruity stimulates motivation and creativity Responds adversely to situations such as humanizing animals or fantasy	Likely to accept humour and to respond to less formal learning context Likely to respond better to more "serious" learning contexts. Likely to show a preference for routine.

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A Brief Guide to Cognitive Style Mapping

I. SYMBOLS AND THEIR MEANINGS

Two types of symbols, theoretical (e.g., words and numbers) and qualitative (e.g., sensory, programmatic, and codes), are created and used by individuals to acquire knowledge and derive meaning from their environments and personal experiences. Theoretical symbols differ from qualitative symbols in that the theoretical symbols present to the awareness of the individual something different from that which the symbols are. Words and numbers are examples of theoretical symbols. Qualitative symbols are those symbols which present and then represent to the awareness of the individual that which the symbol is. (Feelings, commitments and values are some examples of the meanings conveyed by the qualitative symbols.)

T(VL)—Theoretical Visual Linguistics—ability to find meaning from words you see. A major in this area indicates someone who reads with a better than average degree of comprehension.

T(AL)—Theoretical Auditory Linguistics—ability to acquire meaning through hearing spoken words.

T(VQ)—Theoretical Visual Quantitative—ability to acquire meaning in terms of numerical symbols, relationships, and measurements.

T(AQ)—Theoretical Auditory Quantitative—ability to find meaning in terms of numerical symbols, relationships, and measurements that are spoken.

The five qualitative symbols associated with sensory stimuli are:

Q(A)—Qualitative Auditory—ability to perceive meaning through the sense of hearing. A major in this area indicates ability to distinguish between sounds, tones of music, and other purely sonic sensations.

Q(O)—Qualitative Olfactory—ability to perceive meaning through the sense of smell.

Q(S)—Qualitative Savory—ability to perceive meaning by the sense of taste. Chefs should have highly developed qualtitative olfactory and savory abilities.

Q(T)—Qualitative Tactile—ability to perceive meaning by the sense of touch, temperature, and pain.

Q(V)—Qualitative Visual—ability to perceive meaning through sight.

The qualitative symbols that are programmatic in nature are:

Q(PF)—Qualitative Proprioceptive (Fine)—ability to synthesize a number of symbolic mediations into a performance demanding monitoring of a complex task involving small, or fine, musculature (e.g., playing a musical instrument, typewriting); or into an immediate awareness of a possible set of interrelationships between symbolic mediations, i.e., dealing with "signs."

Q(PG)—Qualitative Proprioceptive (Gross)—ability to synthesize a number of symbolic mediations into a performance demanding monitoring of a complex task involving large, or gross, musculature (e.g., throwing a baseball, skiing).

Q(PDF)—Qualitative Proprioceptive Dextral (Fine)—a predominance of right-eyed, right-handed and right-footed tendencies (a typically right-handed person) while synthesizing a number of symbolic mediations into a performance demanding monitoring of a complex task involving small, or fine, musculature (e.g., writing right-handed).

Q(PDG)—Qualitative Proprioceptive Dextral (Gross)—a predominance of right-eyed, right-handed and right-footed tencencies (a typically right-handed person) while synthesizing a number of symbolic mediations into a performance demanding monitoring of a complex task involving large, or gross, musculature (e.g., throwing a baseball with the right hand).

Q(PKF)—Qualitative Proprioceptive Kinematics (Fine)—ability to synthesize a number of symbolic mediations into a performance demanding the use of fine musculature while monitoring a complex physical activity involving motion.

Q(PKG)—Qualitative Proprioceptive Kinematics (Gross)—ability to synthesize a number of symbolic mediations into a performance demanding the use of gross musculature while monitoring a complex physical activity involving motion.

Q(PSF)—Qualitative Proprioceptive Sinistral (Fine)—a predominance of left-eyed, left-handed and left-footed tendencies (a typically left-handed person) while synthesizing a number of symbolic mediations into a performance demanding monitoring of a complex task involving small, or fine, musculature (e.g., writing left-handed).

Q(PSG)—Qualitative Proprioceptive Sinistral (Gross)—a predominance of left-eyed, left-handed and left-footed tendencies (a typically left-handed person) while synthesizing a number of symbolic mediations into a performance demanding monitoring of a complex task involving large, or gross, musculature (e.g., throwing a baseball with the left hand).

Q(PTF)—Qualitative Proprioceptive Temporal (Fine)—ability to synthesize a number of symbolic mediations into a performance demanding the use of fine musculature while monitoring a complex physical activity involving timing.

Q(PTG)—Qualitative Proprioceptive Temporal (Gross)—ability to synthesize a number of symbolic mediations into a performance demanding the use of gross musculature while monitoring a complex physical activity involving timing.

The remaining ten qualitative symbols associated with cultural codes are defined as:

Q(CEM)—Qualitative Code Empathetic—sensitivity to the feelings of others; ability to put yourself in another person's place and see things from his point of view.

Q(CES)—Qualitative Code Esthetic—ability to enjoy the beauty of an object or an idea. Beauty in surroundings or a well-turned phrase are appreciated by a person possessing a major strength in this area.

Q(CET)—Qualitative Code Ethic—commitment to a set of values, a group of principles, obligations and/or duties. This commitment need not imply morality. Both a priest and a criminal may be committed to a set of values although the "values" may be decidely different.

Q(CH)—Qualitative Code Histrionic—ability to exhibit a deliberate behavior, or play a role to produce some particular effect on other persons. This type of person knows how to fulfill role expectations.

Q(CK)—Qualitative Code Kinesics—ability to understand, and to communicate by, non-linguistic functions such as facial expressions and motions of the body (e.g., smiles and gestures).

Q(CKH)—Qualitative Code Kinesthetic—ability to perform motor skills, or effect muscular coordination according to a recommended, or acceptable, form (e.g., bowling according to form, or golfing).

Q(CP)—Qualitative Code Proxemics—ability to judge the physical and social distance that the other person would permit, between oneself and that other person.

Q(CS)—Qualitative Code Syntactics—personal knowledge of oneself.

Q(CT)—Qualitative Code Transactional—ability to maintain a positive communicative interaction which significantly influences the goals of the persons involved in that interaction (e.g., salesmanship).

Q(CTM)—Qualitative Code Temporal—ability to respond or behave according to time expectations imposed on an activity by members in the role-set associated with that activity.

II. CULTURAL DETERMINANTS

There are three cultural determinants of the meaning of symbols: 1) individuality (I), 2) associates (A), and 3) family (F). It is through these "determinants" that cultural influences are brought to bear by the individual on the meanings of symbols.

I—Individuality—Uses one's own interpretation as an influence on meanings of symbols.

A—Associates—Symbolic meanings are influenced by one' peer group.

F—Family—Influence of members of the family, or a few close personal friends, on the meanings of symbols.

III. MODALITIES OF INFERENCE

The third set of the cartesian product indicating cognitive style includes elements which indicate the individual's modality of inference, i.e., the form of inference he tends to use.

M—Magnitude—a form of "categorical reasoning" that utilizes norms or categorical classifications as the basis for accepting or rejecting an advanced hypothesis. Persons who need to define things in order to understand them reflect this modality.

D—Difference—This pattern suggests a tendency to reason in terms of one-to-one contrasts or comparisons of selected characteristics or measurements. Artists often posses this modality as do creative writers and musicians.

R—Relationship—this modality indicates the ability to synthesize a number of dimensions or incidents into a unified meaning, or through analysis of a situation to discover its component parts. Psychiatrists frequently employ the modality of relationship in the process of psychoanalyzing a client.

L—Appraisal—is the modality of inference employed by an individual who uses all three of the modalities noted above (M, D, and R), giving equal weight to each in his reasoning process. Individuals who employ this modality tend to analyze, question, or, in effect, appraise that which is under consideration in the process of drawing a probability conclusion.

K—Deductive—indicates deductive reasoning, or the form of logical proof used in geometry or that employed in syllogistic reasoning.

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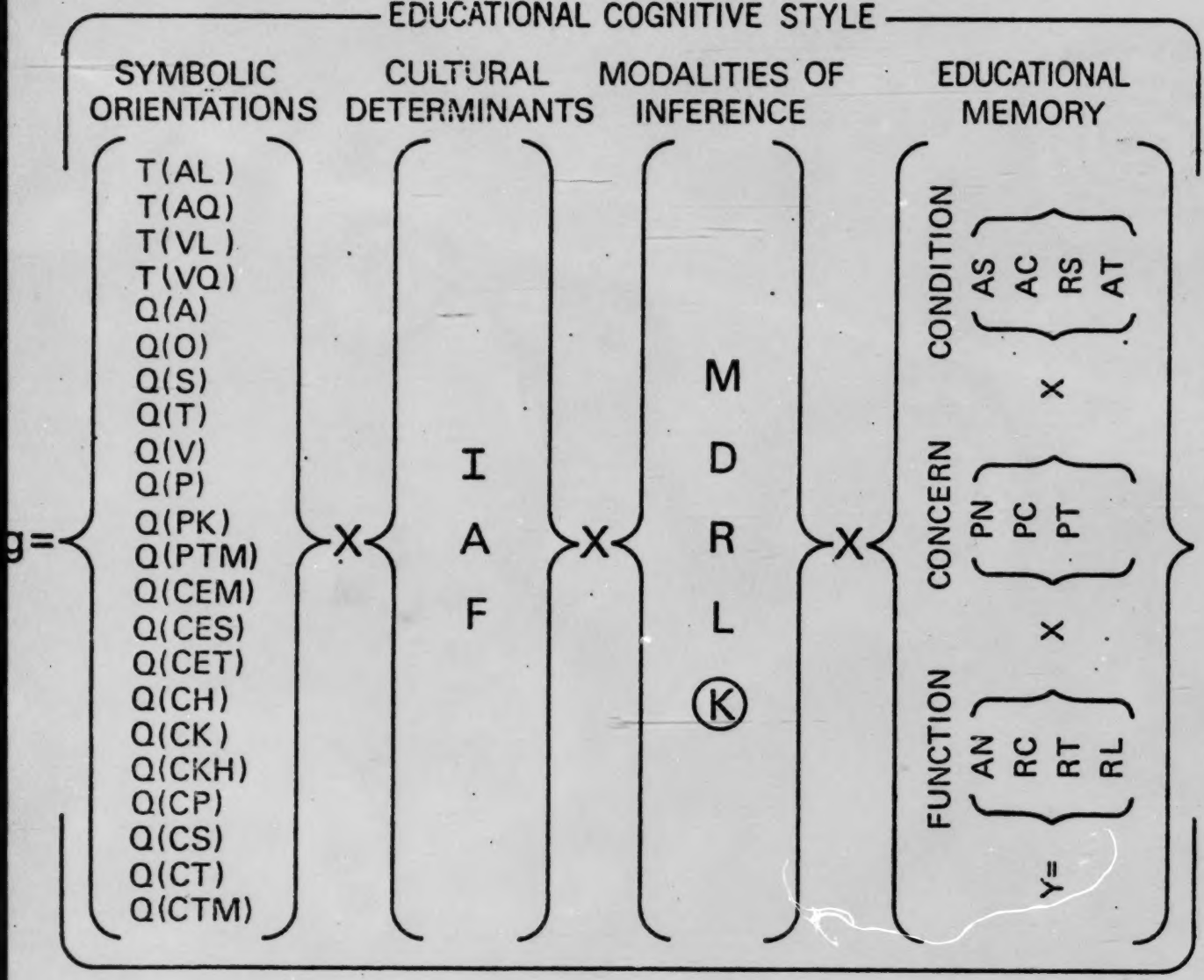
EDUCATIONAL COGNITIVE STYLE
SYMBOLIC ORIENTATIONS
CULTURAL DETERMINANTS
MODALITIES OF INFERENCE
EDUCATIONAL MEMORY
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T(AQ)
T(VL)
T(VQ)
Q(A)
Q(O)
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Q(V)
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APPENDIX C

COMPUTER OUTPUT OF COGNITIVE STYLE MAP

DATE 11/29/76

PAGE 489

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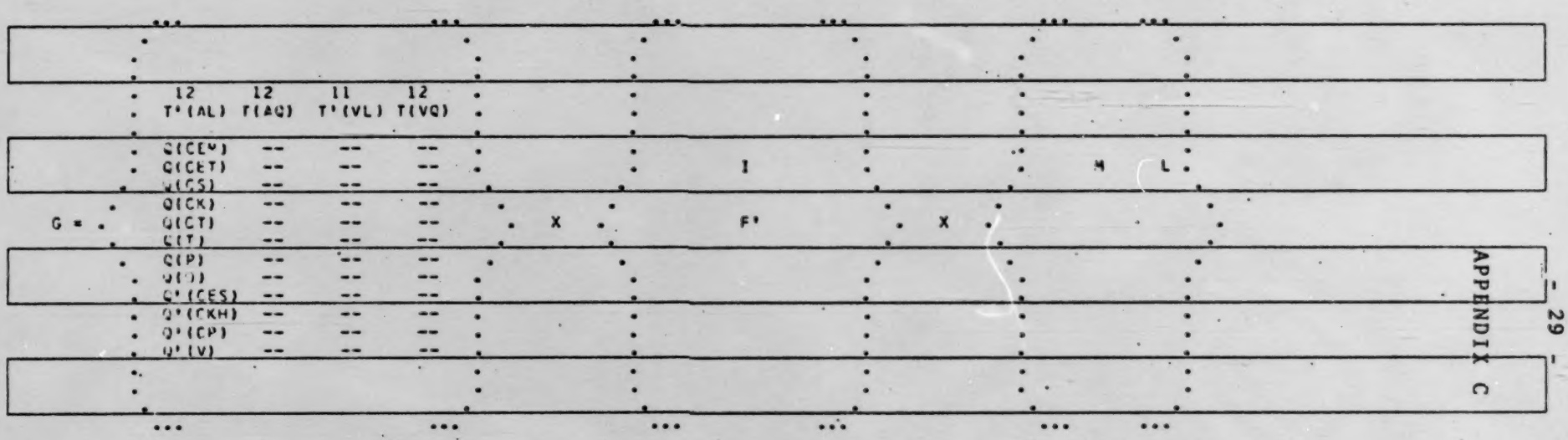

TEST SCORES (DATE PROCESSED 10/30/73)

TEST NO	ELEMENT	PERCENTILE	TEST NO	ELEMENT	PERCENTILE	ELEMENT	PERCENTILE	ELEMENT	PERCENTILE
1	T(VL)	60-69	7,8	Q(CEM)	90-99	Q(CES)	40-49	Q(CET)	80-89
2	T(AL)	40-49		Q(CH)	20-25	Q(CK)	70-79	Q(CKH)	30-39
3	T(VQ)	50-59		Q(CP)	26-29	Q(CS)	70-79	Q(CT)	60-69
4	T(VL)	40-49	9	I	90-99	A	20-25	F	30-39
5	T(AQ)	50-69	10	M	60-69	D	20-25	R	20-25
6	T(VL)	30-39		L	60-69				

CIRCLE K TEST (K) NOT INDICATED

RDLVL 7.1

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